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ADVANCED BUSINESS & TECHNOLOGIES

Shaping favorable conditions for hydrogen mobility deployment

Caroline Le Mer
Air Liquide

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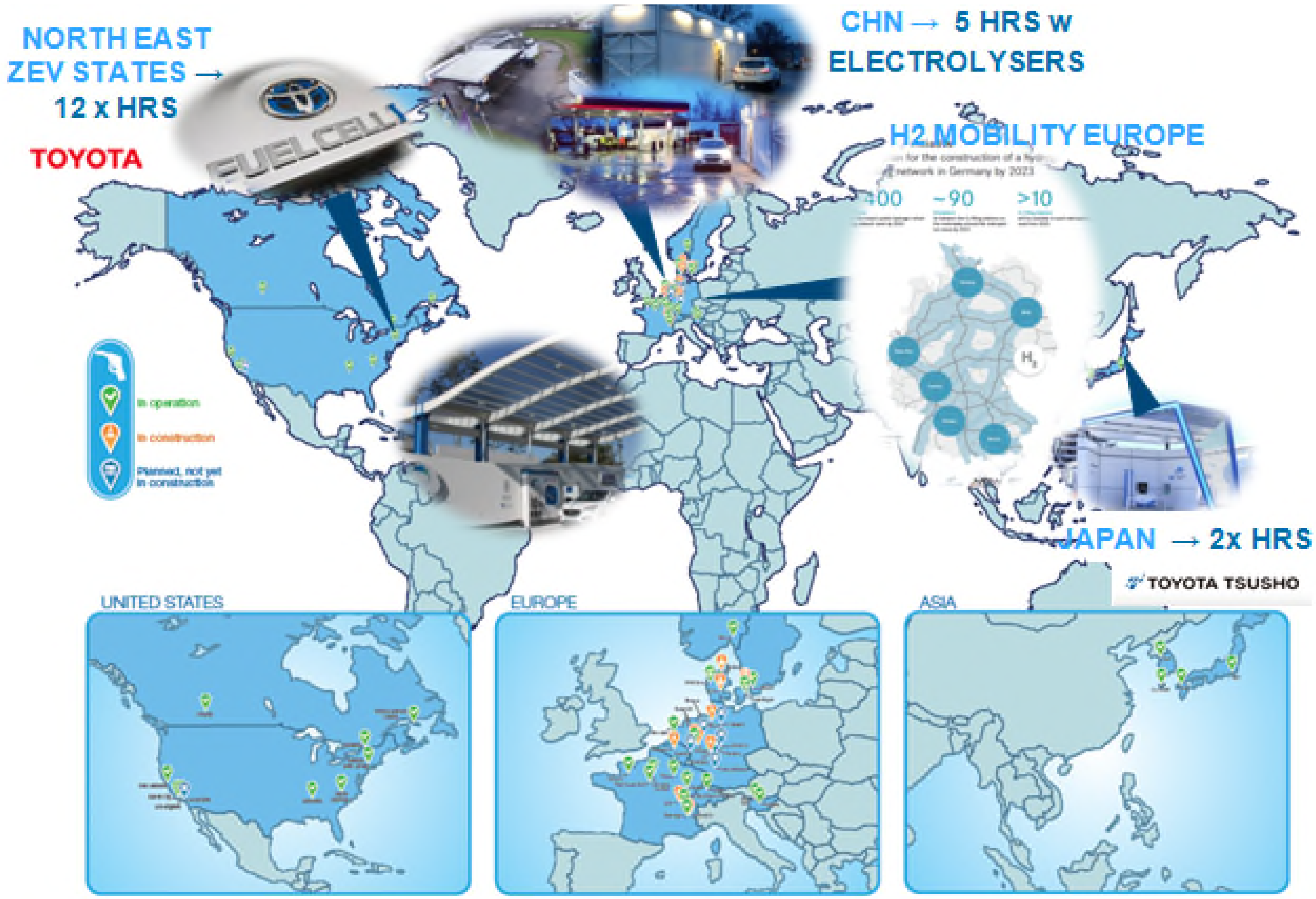
Achievements up to date

- Technology maturity
- Public support for demonstration
- Initial networks of HRS
- First fleets of vehicles

Example of Air Liquide: key partnerships:



Main conditions for a successful market take-off

How will we overcome the « valley of death »?

Alignment between OEM, infrastructure and public authorities

- **Stable and effective policy framework to encourage clean vehicle deployment**
- **Fundings for HRS infrastructure**
  - From subsidies to innovative financing tools
- **Innovative business models & partnerships**

Comparative policy analysis from a customer perspective

■ Existing policy instruments for ZEV in a few selected countries

Incentives		France	California	Denmark	Germany	Sweden	Norway	Japan
Quotas	ZEV manufacturing quota		■					
Monetary incentives	Purchase subsidy	■	■			■		■
Fiscal incentives on CAPEX	VAT purchase tax						■	
	One-time registration tax	■		■	■		■	■
Fiscal incentives on OPEX	Annual tax			■	■	■	■	■
	CO2 emission tax				■	■		
Non fiscal incentives	Free parking	■	■	■	■	■	■	
	Free toll road		■	■			■	
	Access to bus lanes						■	
	High Occupancy Vehicle Lanes		■					
	Low Emission Zone				■	■	■	

Source : « Comparative policy analysis for the transition towards a hydrogen-based passenger car transport " - Alena Kotelnikova 2015

https://sites.google.com/site/alenaglebovna/research

FCEV can already compete with ICE on premium segment

Three representative vehicles from the luxury segment were chosen for the comparison exercise:


Fuel Cell Electric Vehicle (**FCEV):** Mirai


Battery Electric Vehicle (BEV): Tesla Model S


Gasoline Vehicle (ICE): Mercedes CLS

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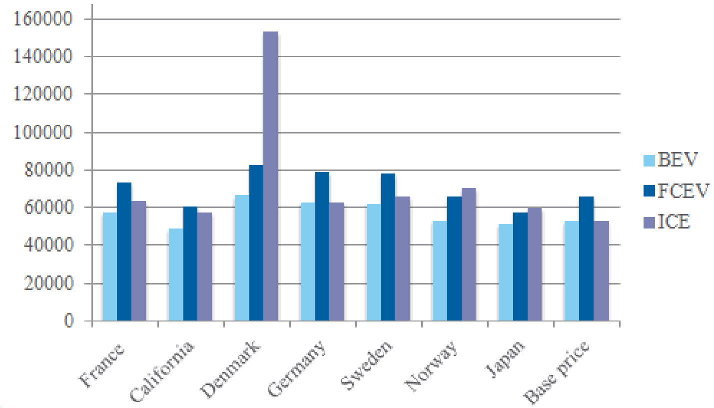
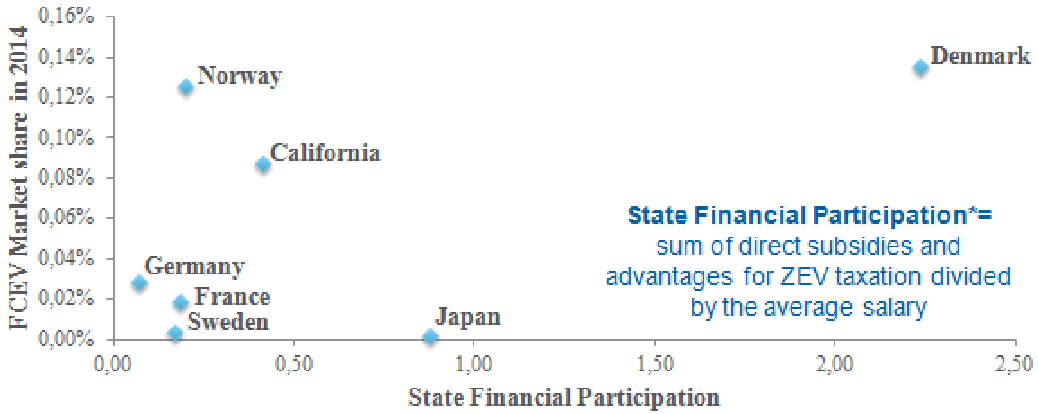
Results of vehicle-related analysis (FCEV vs ICE):

- FCEV is more affordable (purchase price including VAT and registration taxes is lower) than ICE in Denmark, Norway and Japan (by 46%, 6% and 3% respectively)
- In California, France and Sweden FCEV are more expensive at purchase but this can be offset within 10 years by lower Running Cost
- Countries with voluntary State intervention such as Denmark, Norway, California have achieved larger FCEV market share (0.02% vs 0.001%)





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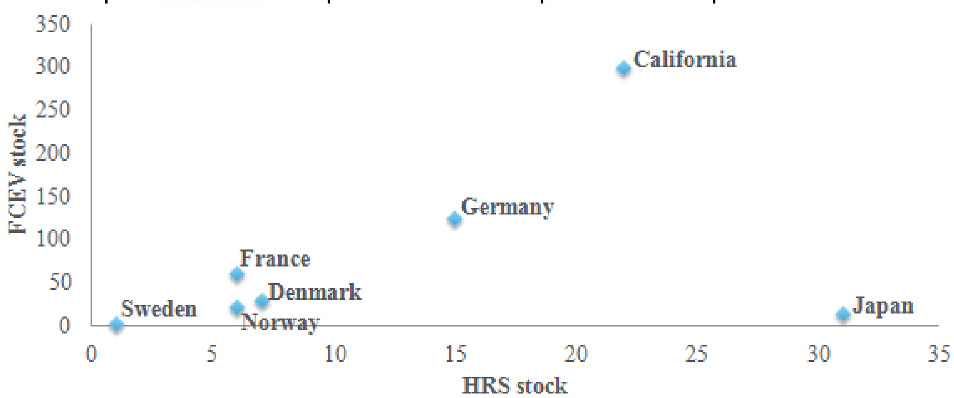
Incentives for infrastructure are also key

Country	Total Car Park	Targets		Policy Instruments			Deployment as of 2015		
		BEV	FCEV	BEV	FCEV	Public Procurement	BEV	FCEV	ZEV+PHEV
California	33M 33% of GHG emissions +26% 2012/1990	1.5M (4.5%) in 2025	18.5k (.05%) in 2020	\$360M for infra (\$100/unit) \$10,000 rebate BEV: ~ €14.4 k ICE: ~ €14.4 k	\$20M for infra (\$300/unit) 100 HRS in 2025 \$12,500 rebate FCEV: ~ €60.5 k ICE: ~ €57.1 k	10% in 2015 25% in 2020	~ 2,500 public stations ~ 70k vehicles R = 3% (nb stations/nb vehicles)	28 HRS 300 vehicles	3.2%
Germany	61.5M 20% of GHG emissions 0% 2012/1990	1M (2%) in 2020	250k (.04%) in 2023 1.8M (3%) in 2030	€130M for infra (€150/unit) BEV: ~ €25.5 k ICE: ~ €15.8 k	€350M for infra (€1600/unit) 400 HRS in 2023 1000 HRS in 2030 FCEV: ~ €78.5 k ICE: ~ €62.7 k	10% from 2013	~ 2,900 public stations ~ 25k vehicles R = 12%	15 HRS 125 vehicles	0.2%
France	38M 25% of GHG emissions +12,4% 2009/1990	2M (5%) in 2020	No	€50M for infra (€26/unit) €6,300 of eco bonus BEV: ~ €19.4 k ICE: ~ €16.2 k	No national subsidies €6,300 of eco bonus FCEV: ~ €72.9 k ICE: ~ €63.5 k	50% in 2015	~ 8,600 public stations ~ 31k vehicles R = 28%	6 HRS ~60 vehicles	0.6%
Japan	77M 20% of GHG emissions + 2% 2012/1990	0.8-1.1M (15-20%) of new car registrations in 2020		€11,000/station €4,600 rebate BEV: ~ €18.5 k ICE: ~ €15.0 k	€27M for demo and infra €14,800 rebate FCEV: ~ €57.6 k ICE: ~ €59.5 k	n/a	~11,500 public stations	31 HRS	0.7%
Denmark	4M 22% of GHG emissions +30% 2010/1990	250k (6%) in 2020	110k (3%) in 2025 50% in 2050	€5.4M /year for infra (€4.5/unit) tax exemptions BEV: ~ €26.8 k ICE: ~ €33.0 k	€30M for infra (€166/unit) 185 HRS in 2025 tax exemptions FCEV: ~ €82.5 k ICE: ~ €153.2 k				



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Need for innovative financing tools for infrastructure

- Main issues for infrastructure deployment:
  - Risk of under-utilization of HRS during first years is high, due to the time needed to develop the car market
  - Not bankable investment projects during the “valley of death” period

- **Innovative funding mechanism** should bring:
  - Participation of private capital (banks, funds) from the beginning of the project, in addition to equity
  - Convergence of interests between project promoters and public authorities
  - Limited impact on budget/public debt – leverage effect

- Proposition of a **mechanism of certificates** issued by governments:
  - Released at the end of the rollout period
  - Proportional to the carbon reduction potential of the HRS X (1 – HRS Utilization)
  - **Act as a guarantee to cover the ramp-up risk and obtain loans from the financial sector**

→ Need for successful implementation in 2016, to prepare next wave of HRS investments

Thank you